Trapezoidal rule:

We calculate the largest possible error of numerical calculating of the integral I =

using trapezoidal rule IT.

We approximate our function f(x) with a straight line S(x) at each small subinterval.

We must find the inequality for D = |I - IT|.

From 0 to h:

Straight line: S(x) = sx + i

Parabola: P(x) = ax2 + bx + c

Both S(x) and P(x) pass through points (x0, y0) and (x1, y1). Here we take x0 = 0 and x1 = h.

Maximum error bound for each small interval: = d1

Total integration error bound: nd1.

n is the number of small intervals, which are h in length, n = (b – a)/h, h = (b – a)/n.

a = m2, where m2 = maximum absolute value of the second derivative f’’(x) at the small interval of h in length.

We must find b, c, s, i using the facts that S(x) and P(x) pass through the points (x0, y0) and (x1, y1).

s = (y1 – y0)/h, i = y0, b = (y1 – y0)/h – ah, c = y0.

d1 = |m2h3/6 + (y1 – y0)h/2 – m2h3/4 + hy0 –((y1 – y0)h/2 + hy0)| ≤ m2h3/12.

Thus, on the whole interval [a, b] D1 ≤ M2h3/12, where is M2 maximum absolute f’’(x) at the whole [a, b] interval.

D = n D1 = |I - IT| ≤M2(b - a)3/(12n2)